

WHAT IS CLAIMED IS:

1. A method for producing a dehydrocyclodimerization catalyst comprising an amorphous phosphorus-modified alumina hydrogel, the method comprising admixing an alumina hydrosol with a phosphorus-containing compound, commingling the phosphorus-modified admixture with a gelling agent which is hydrolyzable at an elevated temperature, dispersing the commingled admixture as droplets in a suspending medium under conditions effective to transform the droplets into hydrogel particles, aging the hydrogel particles in a suspending medium, washing the hydrogel particles with water, drying the hydrogel particles, calcining the hydrogel particles, treating the hydrogel particles with a fluid comprising water and having a concentration of total nitrogen of less than 0.01 mass %, and drying the hydrogel particles to obtain phosphorus-modified alumina particles.

2. The method of Claim 1 further characterized in that the treating occurs at a temperature of from about 50°C to about 100°C and for a time of from about 1 to about 48 hours.

3. The method of Claim 1 further characterized in that the treating occurs for a time of less than 5 seconds.

4. The method of Claim 1 further characterized in that the hydrogel particles are separated from the fluid and the drying of the hydrogel particles to obtain phosphorus-modified alumina particles occurs at a temperature of from about 500°C to about 700°C and for a time of from about 1 to about 15 hours.

5. The method of Claim 1 further characterized in that the fluid consists of at least one of an aqueous solution of a weakly acidic ammonium salt and a dilute acid solution.

6. The method of Claim 1 further characterized in that the fluid contains a weakly acidic ammonium salt or an acid.

7. The method of Claim 6 wherein the weakly acidic ammonium salt is selected from the group consisting of ammonium chloride, ammonium acetate, ammonium nitrate, and mixtures thereof.

8. The method of Claim 6 wherein the acid is selected from the group consisting of hydrochloric, acetic, nitric and sulfuric acid.

9. The method of Claim 1 wherein the gelling agent is selected from the group consisting of hexamethylenetetraamine, urea, and mixtures thereof.

10. The method of Claim 1 wherein the alumina hydrosol has an aluminum to chloride compound weight ratio of from about 0.70:1 to about 1.5:1.

11. The method of Claim 1 wherein the resulting phosphorus-modified admixture has a phosphorus to aluminum molar ratio of from 1:1 to 1:100 on an elemental basis.

12. A method for producing a dehydrocyclodimerization catalyst comprising an amorphous phosphorus-modified alumina hydrogel, the method comprising admixing an alumina hydrosol having an aluminum to chloride compound weight ratio of from about 0.70:1 to 1.5:1 with a phosphorus-containing compound, the phosphorus to aluminum molar ratio in the resulting phosphorus-modified admixture being from 1:1 to 1:100 on an elemental basis, commingling the phosphorus-modified admixture with a gelling agent and spray drying at conditions effective to obtain hydrogel particles, calcining the hydrogel particles, treating the hydrogel particles with a fluid comprising water and having a concentration of total nitrogen of less than 0.01 mass %, and drying the hydrogel particles to obtain phosphorus-modified alumina particles.

13. The method of Claim 12 further characterized in that the treating occurs at a temperature of from about 50°C to about 100°C and for a time of from about 1 to about 48 hours.

14. The method of Claim 12 further characterized in that the
5 treating occurs for a time of less than 5 seconds.

15. The method of Claim 12 further characterized in that the hydrogel particles are separated from the fluid and the drying of the hydrogel particles to obtain phosphorus-modified alumina particles occurs at a temperature of from about 500°C to about 700°C and for a time of from about
10 1 to about 15 hours.

16. The method of Claim 12 further characterized in that the fluid consists of at least one of an aqueous solution of a weakly acidic ammonium salt and a dilute acid solution.

17. The method of Claim 12 further characterized in that the fluid
15 contains a weakly acidic ammonium salt or an acid.

18. The method of Claim 17 wherein the weakly acidic ammonium salt is selected from the group consisting of ammonium chloride, ammonium acetate, ammonium nitrate, and mixtures thereof.

19. The method of Claim 17 wherein the acid is selected from the
20 group consisting of hydrochloric, acetic, nitric and sulfuric acid.

20. A process for preparing a catalyst for converting C₂ to C₆ aliphatic hydrocarbons to aromatics comprising: a) forming particles from a mixture of a zeolite and an aluminum phosphate binder; b) calcining the particles at a temperature of about 450°C to about 816°C and for a time of about 0.5 to about 20 hours; c) impregnating the calcined particles with a
25 gallium salt; d) heating the gallium containing particles in an air/steam mixture at a temperature of about 300°C to about 800°C for a time of about 1 to about 10 hours; e) treating the particles of step (d) with an aqueous solution of a

weakly acidic ammonium salt or a dilute acid solution having a concentration of less than 0.01 mass % nitrogen at a temperature of about 50°C to about 100°C for a time of about 1 to about 48 hours; and f) heating the particles at a temperature of about 500°C to about 700°C for a time of about 1 to about
5 15 hours, thereby providing said catalyst.

21. The process of Claim 20 wherein the gallium content on the catalyst varies from about 0.1 to about 5 weight percent, as the metal, of the catalyst.

22. The process of Claim 20 wherein the zeolite concentration
10 varies from about 30 to about 90 weight percent of the catalyst.

23. The process of Claim 22 wherein the zeolite concentration varies from about 50 to about 70 weight percent of the catalyst.

24. The process of Claim 20 wherein the zeolite is a ZSM family zeolite.

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